

says: "On the plains about Calgary, latitude 51° N., snow disappears rapidly under the influence of the warm, dry wind sweeping up from the great Utah and Columbia basins, which people there erroneously call Chinook." Mr. G. M. Dawson says: "The Chinook is a strong westerly wind, becoming at times almost a gale, which blows from the mountains across the plains. It is extremely dry, and, as compared with the general winter temperature, warm." Professor Harrington says: "They are warm, dry westerly or northerly winds occurring on the eastern slopes of the mountains of the Northwest, beginning at any hour of the day and continuing from a few hours to several days."

The wind is generally considered by writers to be similar to the "Föhn" of the Alps, which is believed to be caused largely by the fact that an ascension of the air to the top of the mountains on the west side serves to abstract nearly all the moisture, and liberation of latent heat warms it so much that it descends on the east a warm, dry wind. This explanation for the "chinook," however, will not hold for the reason that it is felt on the plains where there are no mountain ranges near. The most remarkable circumstance is that a wind from the northwest, which ordinarily brings intense cold, brings great heat. One of the facts developed by Professor Harrington's study of the actual conditions, has been the existence of a well-developed storm or low pressure area to the northward almost without exception. This seems to increase the difficulty in obtaining a true cause for the wind, because, ordinarily, upon the passage of such a low area the westerly or northwesterly wind, while very dry, is also intensely cold as compared with that just preceding.

In order to investigate the conditions preceding these winds it was decided to take out all the cases occurring since the maps of the International Bulletin were begun. The months October to March were studied and all the cases having dry and relatively warm winds from west to north at Virginia City and Helena were selected.

Each of these instances was studied in connection with the international chart giving isobars and isotherms north of the equator. The largest number of cases occurred when there was a low area to the northward, extending far

into the Pacific; the next largest occurred with a prominent high area in the plateau between the Cascade Range and the Rocky Mountains. A few cases occurred with the high area a little farther north. The explanation, then, seems to be the prevalence of a low area to the northward, bringing in air along the southern border from the warm and arid plains and not having a reinforcement of cold air from the northward, as there is no high area in that region, but the low area extends far out upon the Pacific. The same result is brought about when the high area is to the southwestward, causing winds from the west, which are warmed in the arid plateau regions by winds from the south.

The following table shows the more pronounced of these cases:

Dates of chinook winds in northern Montana.		
1877.	1880.	1882.
1. November 15.	19. January 1.	37. February 5.
2. December 8.	20. January 15.	38. February 15.
	21. January 21.	39. February 26.
1878.	22. October 7.	40. March 1.
	23. October 20.	41. March 19.
3. January 10.	24. October 24.	42. March 27.
4. February 11.	25. November 1.	43. October 8-24.
5. February 18.		44. November 22.
6. October 22.	1881.	45. December 2.
7. March 21.		46. December 23.
8. December 2.		
1879.	26. January 4.	1883.
	27. February 2.	
	28. February 22.	
	29. March 1.	
9. January 24.	30. March 25.	47. January 6.
10. February 23.	31. October 7.	48. November 22.
11. February 26.	32. October 30.	49. November 6.
12. March 6.	33. November 26.	50. November 29.
13. March 29.	34. December 8.	51. December 16.
14. October 5.	35. December 15.	
15. October 13.		1884.
16. October 28.	1882.	
17. November 6.		52. February 24.
18. December 15.	36. January 1-7.	53. March 17.
		54. March 26-31.

ANNUAL SUMMARY FOR 1887.

With this REVIEW are issued two additional charts (numbers v and vi) showing respectively the annual isotherms and departures from the normal temperatures for 1887, and the annual precipitation for the same year.

As the more noteworthy meteorological features of the year, may be mentioned: 1st, the large deficiency of rainfall over the central valleys and Southern States, which resulted in the most protracted and disastrous drought that has been known for many years; 2d, the unusually warm weather which prevailed in the northern and central portions of the country east of the Mississippi River in July, during which month many stations reported the highest temperatures recorded since their establishment.

In the table below are given for the Signal Service stations for 1887, the annual mean temperatures; departures from normal temperature; maximum and minimum temperatures, with dates of occurrence; total precipitation; departures from normal, and percentages of normal precipitation. The records from which the normals are computed are not of uniform duration, but for the most part cover periods of twelve to fifteen years:

Stations and districts.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean for 1887.	Departure from normal.	Extremes for 1887.				Total for 1887.	Departure from normal.	Percentage of normal.
			Maximum.	Date of maximum.	Minimum.	Date of minimum.			
<i>New England.</i>									
Eastport.....	41.2	-0.1	83.8	July 3	-13.4	Jan. 19	47.0	-3.5	93
Portland.....	44.4	-2.3	95.8	July 2	-14.7	Jan. 9	49.1	+9.3	123
Nantucket.....	49.2	.....	83.9	July 13	5.2	Jan. 19	37.3	.....	.....
Boston.....	48.2	0.0	95.1	July 2	5.0	Jan. 19	33.8	-14.3	70
Block Island.....	49.7	+0.3	83.4	July 30	1.8	Jan. 19	44.6	-7.3	86
New London.....	49.6	+0.3	80.9	July 13	0.1	Jan. 19	48.0	-0.7	98
New Haven.....	48.6	-1.1	90.2	June 30	-5.4	Jan. 19	44.1	-5.8	88
<i>Middle Atlantic states.</i>									
Albany.....	47.6	-0.6	95.0	July 13	-15.3	Jan. 19	39.7	+1.9	105
New York City.....	51.9	+0.7	94.0	July 16	6.0	Jan. 19	46.6	+3.2	107
Atlantic City.....	51.8	-0.1	97.0	July 18	7.0	Jan. 19	37.9	-4.9	89
Philadelphia.....	53.8	+0.7	99.9	July 16	8.1	Jan. 3	42.2	+1.6	104
Baltimore.....	54.6	-0.9	101.8	July 18	7.3	Jan. 3	43.6	+1.1	103
Washington City.....	54.8	-0.1	102.8	July 18	6.2	Jan. 3	35.1	-8.4	81
Norfolk.....	58.4	-0.8	102.5	July 18	12.6	Jan. 19	47.7	-3.3	94
Lynchburg.....	56.4	-0.8	101.8	July 18	6.1	Jan. 4	40.6	-2.2	95

Table of annual mean, departures from normal, and maximum and minimum temperatures, &c.—Continued.

Stations and districts.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean for 1887.	Departure from normal.	Extremes for 1887.				Total for 1887.	Departure from normal.	Percentage of normal.
			Maximum.	Date of maximum.	Minimum.	Date of minimum.			
<i>South Atlantic states.</i>									
Hatteras.....	61.4	-0.1	89.4	July 17	19.8	Jan. 19	55.1	-18.9	74
Raleigh.....	58.3	.....	103.0	July 18	8.4	Jan. 4	59.2	.....	89
Wilmington.....	62.5	-0.7	100.0	July 17, 18	14.6	Jan. 19	51.5	-6.3	94
Charlotte.....	59.5	-0.8	102.2	July 18	8.2	Jan. 4	51.2	-3.5	92
Augusta.....	63.6	-0.7	103.8	July 17, 18	14.7	Jan. 4	45.1	-3.9	94
Charleston.....	64.9	-1.0	99.6	June 19	16.7	Jan. 4	44.7	-15.8	82
Savannah.....	65.1	-1.7	101.6	July 18	16.0	Jan. 4	44.6	-9.5	84
Jacksonville.....	68.1	-1.7	100.3	July 18	21.9	Jan. 4	58.6	+1.4	102
<i>Florida Peninsula.</i>									
Cedar Keys.....	69.4	-1.3	92.1	July 20	24.0	Jan. 4	44.2	-14.1	76
Key West.....	76.1	-1.4	89.9	July 23	50.2	Jan. 4	43.6	+3.9	110
<i>East Gulf states.</i>									
Atlanta.....	61.2	-0.1	100.0	July 19	9.0	Jan. 2	50.4	-6.0	89
Montgomery.....	65.5	+0.1	102.0	June 19	12.9	Jan. 3	44.7	-8.9	83
Pensacola.....	68.1	+0.1	98.6	July 29	20.3	Jan. 3	52.3	-15.6	77
Mobile.....	66.7	+0.2	97.5	June 29	15.9	Jan. 3	52.0	-13.8	79
Vicksburg.....	65.7	+0.1	97.3	July 19	9.6	Jan. 3	42.2	-18.6	69
New Orleans.....	68.4	-0.7	95.8	July 31	21.4	Jan. 3	65.0	+0.6	101
<i>West Gulf states.</i>									
Fort Smith.....	60.8	+1.8	103.8	July 31	-4.0	Jan. 3	38.7	-4.3	90
Shreveport.....	66.0	+0.5	103.8	July 31	12.0	Jan. 3	42.2	-12.2	78
Palestine.....	65.1	+0.6	101.5	July 22	10.6	Dec. 21	38.0	-7.9	83
San Antonio.....	68.1	+1.0	100.9	June 1	16.8	Jan. 3	20.1	-12.4	63
Galveston.....	69.7	-0.4	93.4	July 24	23.5	Jan. 10	43.4	-9.6	82
<i>Rio Grande Valley.</i>									
Rio Grande City.....	72.8	-0.5	108.3	May 1	25.0	Jan. 10	32.2	+9.2	140
Brownsville.....	71.1	-1.5	92.7	Aug. 17, 26	26.2	Dec. 22	59.9	+27.0	183
<i>Tennessee.</i>									
Nashville.....	59.8	+0.3	99.3	Aug. 3	-1.8	Jan. 2	48.4	-4.5	91
Memphis.....	61.9	+0.9	99.0	July 31	4.3	Jan. 3	42.5	-12.2	78
Chattanooga.....	60.1	+0.1	99.2	July 19	7.4	Jan. 2	51.1	-8.3	80
Knoxville.....	58.8	+1.6	100.2	July 19	5.4	Jan. 3	43.0	-11.0	80
<i>Ohio Valley.</i>									
Pittsburg.....	54.1	+2.2	101.2	July 17	-4.0	Jan. 4, 19	42.0	+5.3	114
Columbus.....	52.8	-0.7	100.2	July 17	-5.0	Jan. 2, 11	30.2	-12.1	71
Indianapolis.....	52.6	-0.2	100.8	July 30	-11.8	Jan. 3	33.1	-13.4	71
Cincinnati.....	55.3	+0.3	101.2	July 18	-5.2	Jan. 3	35.1	-8.0	78
Louisville.....	57.7	+1.0	101.7	July 29	-4.7	Jan. 2	38.2	-10.8	71
<i>Lower lake region.</i>									
Detroit.....	48.4	+0.3	101.0	July 17	-3.0	Jan. 11	29.0	-5.4	85
Toledo.....	48.8	-1.2	98.6	July 17	-10.3	Jan. 11	32.0	-0.8	98
Sandusky.....	49.3	-1.1	98.0	July 17	-8.0	Jan. 11	29.9	-9.7	75
Cleveland.....	49.3	+0.5	95.2	July 17	-5.9	Jan. 11	35.4	-2.8	93
Erie.....	48.1	+1.0	93.6	Aug. 4	-3.5	Jan. 11	45.1	+1.7	104
Buffalo.....	46.8	+0.4	94.2	Aug. 4	-1.7	Jan. 18	31.6	-6.5	83
Rochester.....	46.3	-0.4	95.0	July 16	-4.6	Jan. 18	20.3	-15.9	56
Oswego.....	45.2	-1.9	90.4	July 16	-9.6	Jan. 8	23.4	-12.1	56

Table of annual mean, departures from normal, and maximum and minimum temperatures, &c.—Continued.

Stations and districts.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean for 1887.	Departure from normal.	Extremes for 1887.				Total for 1887.	Departure from normal.	Percentage of normal.
			Maximum.	Date of maximum.	Minimum.	Date of minimum.			
<i>Upper lake region.</i>									
Duluth	37.3	-2.2	94.8	July 15	-27.8	Jan. 30	28.6	-4.5	86
Marquette	39.0	-1.7	97.0	July 15	-20.6	Jan. 31	25.6	-7.4	78
Escanaba	39.4	-0.8	85.5	July 15	-24.4	Jan. 31	23.0	-12.3	65
Milwaukee	44.6	-0.2	99.9	July 16	-15.9	Jan. 7	30.5	-3.2	91
Chicago	47.7	-0.8	99.8	July 16	-15.3	Jan. 3	29.1	-8.7	77
Grand Haven	45.7	-0.9	90.9	Aug. 10	-7.3	Feb. 1	32.8	-6.8	83
Mackinaw City	39.9	+0.6	89.0	July 8	-14.4	Jan. 31	15.1	-21.3	41
Alpena	40.6	-0.3	92.8	Aug. 4	-15.7	Jan. 31	37.9	+0.2	103
Green Bay	43.0	.....	98.4	July 16	-28.8	Jan. 7	32.6	.....	.....
Port Huron	45.2	+0.3	99.1	July 17	-9.0	Jan. 11	24.8	-9.8	72
Lansing	48.9	.....	99.7	July 17	-14.0	Jan. 7	31.5	.....	.....
<i>Extreme Northwest.</i>									
Fort Buford	37.7	-0.3	90.4	June 25	-45.2	Jan. 1	15.4	+0.7	104
Bismarck	38.0	-1.4	96.8	June 15	-43.6	Jan. 2	16.3	-4.4	79
Fort Totten	34.1	.....	91.2	June 6, 14	-39.0	Jan. 6	19.4	.....	.....
Moorhead	36.5	-0.2	95.5	May 10	-47.5	Jan. 8	22.0	-5.9	79
Saint Vincent	33.3	+0.1	96.0	May 14	-44.1	Dec. 29	18.5	-0.4	98
<i>Up. Mississippi valley.</i>									
Saint Paul	42.1	-1.7	93.9	July 15	-35.7	Jan. 18	25.8	-3.4	88
La Crosse	45.0	-1.5	98.4	July 16	-28.9	Jan. 7	17.4	-16.7	51
Dubuque	47.4	-0.4	100.6	July 16	-31.5	Jan. 7	34.4	-5.4	86
Des Moines	48.2	-0.2	101.7	July 29	-24.5	Jan. 7	24.6	-16.8	59
Keokuk	51.4	-0.2	100.0	Aug. 10	-18.5	Jan. 7	26.3	-11.6	69
Springfield	52.8	+0.2	99.7	July 29	-18.2	Jan. 2	25.2	-20.9	55
Saint Louis	57.5	+2.2	100.0	July 17	-9.6	Jan. 2	35.3	-3.0	92
Cairo	58.2	+2.0	97.5	July 30	-1.1	Jan. 2	26.8	-18.9	59
<i>Missouri Valley.</i>									
Fort Sully	43.9	.....	103.7	July 14	-28.5	Jan. 8	14.3	.....	.....
Yankton	45.3	-0.2	98.7	Aug. 9	-29.1	Jan. 8	27.1	-1.3	95
Huron	41.0	-0.8	99.2	July 14	-42.8	Jan. 8	25.3	+1.0	104
Omaha	49.0	-0.5	103.3	July 29	-21.9	Jan. 2, 6	19.9	-16.6	54
Leavenworth	52.7	-0.4	101.7	July 17	-15.5	Jan. 9	37.0	-2.0	94
Lamar	55.2	.....	99.0	July 30	-18.1	Jan. 9	35.7	.....	.....
Valentine	45.1	.....	97.2	July 14	-31.5	Nov. 27	18.0	.....	.....
<i>Northern slope.</i>									
Fort Assinaboine	39.6	-1.7	93.1	July 6	-55.4	Feb. 3	18.9	+4.8	133
Helena	41.9	-1.3	91.5	July 6	-40.5	Feb. 2	14.0	-1.3	91
Fort Custer	43.7	-0.4	102.6	June 25	-34.0	Feb. 11	12.2	-1.8	88
Poplar River	36.3	.....	100.7	June 2	-44.8	Feb. 3	15.5	.....	.....
Fort Maginnis	40.6	+0.2	91.3	July 6	-42.0	Feb. 20	20.0	+1.1	215
Deadwood	42.8	+1.2	92.4	June 25	-29.0	Feb. 23	31.7	+5.2	120
North Platte	47.6	0.0	99.8	Aug. 9	-25.2	Nov. 26	21.7	+2.1	111
<i>Middle slope.</i>									
Denver	50.3	+1.1	95.9	June 25	-17.6	Jan. 8	12.5	-2.6	83
Dodge City	53.0	+0.9	101.8	Aug. 10	-17.0	Jan. 9	14.2	-7.2	66
Las Animas	52.3	+2.8	99.8	Aug. 7	-18.0	Jan. 9	13.5	-0.2	99
Fort Elliott	56.5	+1.9	98.7	July 21	-5.4	Nov. 27	22.8	-1.8	92
Concordia	51.7	.....	102.4	July 29	-18.7	Jan. 9	25.3	.....	.....
<i>Southern slope.</i>									
Abilene	63.7	.....	101.3	July 20	6.3	Jan. 8, 9	24.6	.....	.....
Fort Davis	60.5	+0.5	94.2	July 25	-1.3	Dec. 23	18.5	-1.0	95
Fort Stanton	49.8	.....	91.0	July 24	-18.2	Dec. 22	16.8	.....	.....
<i>Southern plateau.</i>									
Frederick	53.6	+1.4	97.0	June 23	7.5	Dec. 22	17.4	+2.0	113
Fort Grant	60.5	+0.4	98.6	June 24	7.4	Dec. 22	24.3	+8.2	150
Fort Apache	54.9	+2.6	102.0	June 24	1.1	Dec. 22	17.8	+4.8	78
El Paso	63.6	+0.4	103.0	July 25	-2.4	Dec. 23	6.8	-5.6	55
Keeler	60.8	.....	99.2	June 22	22.0	Feb. 20	5.0	.....	.....
<i>Middle plateau.</i>									
Salt Lake City	52.7	+1.5	97.9	July 6	8.7	Dec. 21	11.7	-5.6	68
Montrose	48.6	.....	93.6	July 6	-16.2	Dec. 22	9.6	.....	.....
Fort Bidwell	47.6	.....	90.0	July 5	-2.0	Feb. 20	16.5	.....	.....
Fort Bridger	41.6	.....	87.0	June 8	-18.1	Dec. 21	8.9	.....	.....
Frisco	49.8	.....	90.0	July 6	0.4	Dec. 21	7.1	.....	.....
Winnemucca	49.2	-0.2	97.7	June 22	-3.1	Nov. 26	8.0	-1.9	81
<i>Northern plateau.</i>									
Spokane Falls	47.2	-0.1	97.3	Aug. 17	-11.0	Feb. 3	20.1	-1.6	92
Boise City	51.4	.....	100.3	July 6	5.6	Nov. 26	11.3	.....	.....
Walla Walla	52.6	.....	98.7	May 30	-3.0	Feb. 7	20.4	.....	.....
<i>N. Pac. coast region.</i>									
Olympia	49.2	-0.3	93.2	June 21	2.4	Feb. 5	61.8	+7.6	114
Portland	52.0	-0.5	99.0	May 29	9.1	Feb. 4	54.2	+1.8	103
Roseburg	52.4	-0.2	102.0	May 29	7.0	Feb. 5	37.3	+2.2	106
Port Canby	48.8	.....	90.7	June 21	13.8	Feb. 4	73.8	.....	.....
Port Angeles	45.0	.....	81.5	Aug. 11	2.6	Feb. 5	34.2	.....	.....
Tatoosh Island	47.4	.....	69.6	Sept. 6	14.8	Feb. 2	106.1	.....	.....
<i>Md. Pac. coast region.</i>									
Red Bluff	64.4	+2.0	111.5	July 8	27.3	Nov. 27	13.6	-14.6	48
Sacramento	59.9	+0.5	100.0	Sept. 15, 27	28.0	Nov. 27	13.4	-9.8	58
San Francisco	55.5	+0.6	96.9	May 28	33.1	Feb. 5	19.0	-4.9	79
<i>S. Pac. coast region.</i>									
Los Angeles	61.7	+0.9	100.1	June 16	33.1	Jan. 12	16.3	-1.0	94
San Diego	60.6	0.0	85.0	Oct. 29	35.5	Dec. 22	10.4	+1.4	114
Yuma	72.9	+1.0	115.5	June 23	27.1	Dec. 23	3.9	+1.4	156

The data here presented shows that the year 1887 was colder than the average in the northern districts of the country, along the Gulf coast, and in the Atlantic coast states to the south of New Jersey, while in California, the central and southern Rocky Mountain districts, and over a belt of country extending thence

east-northeast to the New Jersey coast, the annual mean temperatures were above the normal. At but few stations have the departures exceeded 2°, or even amounted to as much as 1°, and it may be said that the year 1887, with respect to temperature, more nearly approached the normal than either of the two preceding years (1885 and 1886), for which annual summaries of temperature and rainfall have been published.

In 1885 the departures (below) from the normal temperature exceeded 2° over nearly all the country east of the Mississippi, and numerous stations showed deficiencies exceeding 4°, while in the Rocky Mountain districts and on the Pacific coast the departures (above normal) were equally as marked.

In 1886, the departures from normal temperature were not so marked as those for the preceding year, but they were greater than for 1887, and in the Southern States deficiencies exceeding 3° occurred at some of the Gulf stations.

The following are the most marked departures from the normal for 1887 at stations where records exceed twelve years:

Above normal.		Below normal	
Pittsburg, Pa.	2.2	Portland, Me.	0.3
Saint Louis, Mo.	2.2	Duluth, Minn.	2.2
Cairo, Ill.	2.0	Oswego, N. Y.	1.9
Knoxville, Tenn.	1.6	Marquette, Mich.	1.7
Salt Lake City, Utah.	1.5	Saint Paul, Minn.	1.7
Denver, Colo.	1.1	La Crosse, Wis.	1.5

The distribution of rainfall for the year 1887 is exhibited on chart number vi, in the preparation of which records from about eight hundred stations have been used.

In the following table are given the normal and current annual mean temperatures and rainfalls, departures, and extremes for past years, as reported from voluntary stations:

Stations.	Temperature.				Precipitation.			
	Normal.	Number of years.	Mean for 1887.	Departure.	Highest mean.	Lowest mean.	Normal.	Number of years.
California.								
Sacramento.	60.0	22	57.0	-3.0	62.0 1875	57.0 1887	19.2	38
Illinois.								
Sandwich.	45.0	38	50.5	+5.5	50.7 1863	.....	40.7	40
Iowa.								
Muscatine.	52.9	20	53.1	-0.2	55.3 1878	50.5 1869	34.7	20
Kansas.	53.0	7	53.0	0.0	.....	.....	33.2	7
Lawrence.	44.0	49	43.0	-1.0	.....	.....	44.6	49
Yates Centre.	51.4	16	51.4	0.0	53.0 1874	50.0 1875	30.4	17
Maine.	51.4	16	51.4	0.0	53.0 1874	50.0 1875	30.4	17
Maryland.	50.0	16	47.0	-3.0	.....	.....	47.5	16
Cumberland.	39.0	17	40.0	+1.0	.....	.....	44.3	16
Fallston.	50.0	16	47.0	-3.0	.....	.....	47.5	16
Massachusetts.	50.0	16	47.0	-3.0	.....	.....	47.5	16
Shunton.	39.0	17	40.0	+1.0	.....	.....	44.3	16
Somerset.	.....	.....	.....	.....	.....	.....	.....	.....
Nevada.	.....	.....	.....	.....	.....	.....	.....	.....
Carson City.	.....	.....	.....	.....	.....	.....	.....	.....
New York.	.....	.....	.....	.....	.....	.....	.....	.....
Mexico.	44.0	34	43.0	-1.1	51.8 1878	41.4 1883	.....	.....
Palermo.	43.0	34	43.0	0.0	52.0 1878	41.0 1883	.....	.....
Ohio.	.....	.....	.....	.....	.....	.....	.....	.....
N. Lewisburg.	50.8	56	52.4	+1.5	.....	.....	39.1	36
Pennsylvania.	44.2	14	44.7	+0.5	.....	.....	37.0	17
Dyberry.	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee.	.....	.....	.....	.....	.....	.....	.....	.....
Ashwood.	.....	.....	.....	.....	.....	.....	.....	.....
Virginia.	.....	.....	.....	.....	.....	.....	.....	.....
Variety Mills.	.....	.....	.....	.....	.....	.....	.....	.....
W. Virginia.	50.0	12	51.0	+1.0	51.0 1886	48.0 1885	54.5	12
Holvetia.	.....	.....	.....	.....	.....	.....	.....	.....

The precipitation for the year over the greater part of the country was below the normal, the deficiency being most marked in portions of Michigan, Wisconsin, Iowa, Illinois, Indiana, and Ohio, where at many stations the total rainfall did not exceed 60 per cent. of the yearly normal. In the states bordering on the Atlantic the rainfall in general was about normal, being slightly in excess at some stations in New England and the middle Atlantic states and slightly deficient from Virginia southward; it was also about normal on the north Pacific coast; in the lower Rio Grande valley and portions of Arizona

and southern California there was a marked excess; and on the middle Pacific coast the annual rainfall ranged from 50 to 75 per cent. of the average.

From chart vi it will be seen that the yearly rainfall on the north Pacific coast reaches 100 inches (Tatoosh Island, Wash., reporting 106 inches) and that it falls below 5 inches over portions of the middle and southern plateau districts and southern California.

The following notes on the meteorological features of the year are also furnished by voluntary observers:

California.—Santa Barbara, Santa Barbara Co.: during the year there were but twenty-six days on which the temperature rose to 80°; of these, twelve occurred either before April 1st or after October 1st, leaving but fourteen for the summer season.

Georgia.—Mr. Samuel A. Cook, observer at Milledgeville, states: From an agricultural point of view the year 1887 was unfavorable for nearly all crops, owing to alternate droughts and freshets, the ill effects of which can only be understood from a study of the record in detail, as the yearly rainfall is fully up to the normal. The rainfall of July, 1887, 16.09 inches, was the heaviest monthly fall ever known at this place.

Kansas.—Prof. F. H. Snow of the University of Kansas, furnishes the following meteorological summary for 1887, from observations taken at Lawrence:

The year was marked by a cold winter and a warm spring, while the summer and autumn were of nearly the average temperatures. The total rainfall fell but little short of the average amount, but its distribution was unfavorable to corn and other midsummer crops. A serious deficiency in July found the ground nearly destitute of moisture, on account of the eleven-inch deficiency of the year 1886, and in less than two weeks what promised to be the most abundant corn crop ever produced in the state was reduced to very small proportions. The abundant crops of oats, hay, potatoes, and other spring and autumn products gave the state of Kansas a great advantage over other states which suffered from a more serious drought without similar compensations.

Other characteristics of the year were the small percentage of cloudiness, the moderate wind-velocity, and the astonishingly low barometer of February 3d, the lowest barometric reading on our twenty-years' record.

The mean temperature of the winter months, 26° 3, is 2° 6 below the average winter temperature; of the spring, 56° 3, is 2° 7 above the average; of the summer, 75° 8, is 0° 1 below the average; of the autumn, 54°, is 0° 1 above the average.

The warmest month of the year was July, with mean temperature 79° 8; the warmest week was July 11th to 17th, mean 86° 8; the warmest day was July 17th, mean 89° 5. The mercury reached, or exceeded, 90° on forty days (just the average number), viz., one in May, five in June, eighteen in July, ten in August, and six in September. There was only one day on which the temperature reached 100°, July 17th.

The coldest month was January, with mean temperature 20° 5; the coldest week was January 1st to 7th, mean temperature 4° 4 above zero; the coldest day was January 8th, mean 7° 1 below zero. The mercury fell below zero on sixteen days—nine in January, three in February, and four in December.

The last severe frost of spring was on April 4th; the first severe frost of autumn was on the 24th of October, giving an interval of two hundred and three days, or nearly seven months with severe frosts; the average interval is one hundred and ninety-eight days.

New Jersey.—The following summary for 1887, is furnished by Prof. George H. Cook, director of the state weather service.

Temperature (in degrees Fahrenheit).—Annual mean, 51.1; maximum, 102.0, at Matawan, July 8th, and Clayton, July 16th; minimum, 4.5 below zero, at Dover, January 8th; range for state 106.5; mean winter temperature, 32.6; mean spring temperature, 47.9; mean summer temperature, 71.7; mean autumn temperature, 52.1.

Precipitation, including melted snow (in inches).—Average monthly rainfall for the state, 4.01; greatest annual, 53.31, at Somerville; least annual, 87.91, at Atlantic City; greatest monthly, 14.00, at Matawan, July; least monthly, 0.08, at Matawan, May.

Precipitation by seasons (in inches).—Winter, 13.63; departure from the normal, +3.86. Autumn, 8.04; departure from the normal, -3.64. Summer, 18.46; departure from the normal, +5.60. Spring, 7.53, departure from the normal, -4.29.

New York.—Mexico, Oswego Co.: the following is from the "Mexico Independent" of January 25, 1888: the year 1887 was marked with an excessively cold January, a long, hot summer, a dry atmosphere, light winds and clear skies. But the most remarkable characteristic of the year was the very light rainfall; during the spring months, March, April, and May, the rainfall was 4.05 inches below the average, and for the year there was a deficiency of 8.24 inches.

Ohio.—Prof. B. F. Thomas, director of the Ohio Meteorological Bureau, gives the following summary for the state:

The mean temperature, 51° 4, is the highest annual mean since the bureau was established. The maximum temperature, 108°, at Pomeroy, on July 18th, is also the highest temperature on record, and is 7° higher than the maximum for July 21, 1885, at the Ohio State University. The lowest temperature reported during the year was -21°, at Paulding, on January 7th.

The rainfall, 33.63 inches, is 6.36 inches below the normal for the state. Rain fell on 120.9 days, which is 17 days below the average.

The year is remarkable from having the highest barometer, the highest maximum temperature, the highest mean temperature, and the smallest rainfall on record since the opening of the bureau.

Table showing monthly and annual mean temperatures at Grampian Hills, Clearfield Co., Pa., from observations made by Messrs. Elisha Fenton, Jonathan Kirk, and Nathan Moore.

[Temperature in degrees Fahrenheit.]

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1864	.....	.....	.....	.....	.....	.....	72.0	69.8	57.7	45.6	36.2	27.0	.....
1865	18.5	25.0	38.0	47.0	57.2	70.0	67.5	65.2	67.0	48.5	37.1	26.7	47.3
1866	22.6	24.4	31.0	48.3	55.3	66.0	72.4	62.1	59.5	48.8	37.8	22.8	47.5
1867	16.1	30.3	29.0	45.0	48.3	67.5	67.9	67.2	59.4	46.7	36.6	22.1	44.7
1868	19.2	16.6	32.6	36.9	52.2	63.9	75.8	68.0	56.6	43.5	35.5	20.5	43.3
1869	26.5	25.7	25.7	41.6	51.7	63.5	66.8	67.3	59.3	39.2	28.3	26.1	43.3
1870	27.2	22.1	27.4	45.8	59.1	68.0	70.9	68.6	60.4	47.7	34.8	23.2	46.2
1871	22.3	24.0	36.4	46.4	57.8	66.2	67.3	70.0	54.2	47.5	30.9	21.3	45.3
1872	20.0	20.9	22.0	44.5	56.2	66.1	70.7	68.9	58.9	44.5	29.3	16.1	43.2
1873	19.4	20.2	26.3	41.5	54.7	67.8	68.5	64.4	56.6	44.3	34.1	30.8	44.0
1874	30.1	27.7	31.0	36.1	58.2	69.1	71.0	65.7	64.2	47.5	35.2	29.0	47.0
1875	17.0	15.0	28.4	29.0	56.6	66.2	69.3	65.6	57.5	47.2	36.3	25.1	42.7
1876	33.5	27.3	30.0	40.6	54.4	69.3	72.0	71.3	57.4	43.5	38.3	16.0	46.1
1877	20.7	30.0	29.3	44.1	55.0	66.5	70.9	69.3	61.8	53.6	39.1	37.0	48.1
1878	27.0	31.0	40.4	52.2	55.0	61.3	74.0	70.0	61.0	51.2	37.0	23.4	48.6
1879	20.3	21.3	34.3	41.8	59.0	66.4	72.0	67.1	58.2	46.4	37.9	32.0	47.2
1880	35.0	29.6	31.7	45.3	65.7	65.0	73.2	68.4	61.7	48.0	30.3	19.6	47.8
1881	19.5	22.0	32.3	40.7	59.0	63.5	72.0	73.1	72.0	55.0	31.1	24.5	47.9
1882	25.1	32.0	35.4	42.8	50.0	66.2	68.6	68.8	63.3	55.0	34.5	34.0	47.0
1883	19.0	24.0	25.0	43.3	56.0	68.0	70.8	66.0	58.5	47.5	37.3	26.3	45.1
1884	17.0	28.0	30.7	41.0	53.5	65.3	66.6	66.3	66.0	51.7	35.7	25.6	44.3
1885	17.8	13.7	20.1	41.2	57.0	65.8	72.1	66.6	59.8	44.4	33.8	24.2	43.0
1886	19.5	22.8	32.8	51.0	61.5	65.8	70.0	68.0	65.8	50.4	35.2	21.5	47.0
1887	22.1	30.3	29.5	44.0	65.1	68.4	76.8	65.6	59.0	45.4	35.8	28.0	47.4
Mean.	22.4	24.5	30.4	43.0	56.4	66.3	70.8	67.7	60.6	48.0	34.9	25.1	45.7

Table showing monthly and annual precipitation at Grampian Hills, Clearfield Co., Pa., from observations made by Nathan Moore.

[Precipitation in inches and hundredths.]

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1864	.....	.....	.....	.....	.....	.....	4.16	5.68	4.32	2.52	3.96	5.01	.....
1865	3.24	3.52	6.24	3.42	4.53	3.63	4.16	5.37	6.18	3.13	2.07	3.57	48.08
1866	2.55	3.36	4.70	3.14	1.83	3.35	5.25	5.08	5.67	4.08	4.21	3.83	48.37
1867	2.72	3.46	4.50	4.36	7.17	1.31	4.21	4.14	1.49	2.88	2.16	4.54	43.04
1868	3.32	3.79	4.00	4.36	5.91	7.28	5.35	3.95	6.48	2.82	3.26	3.00	46.67
1869	5.12	2.34	4.56	1.88	5.18	7.28	3.65	2.21	2.95	1.81	3.27	4.94	49.43
1870	6.16	4.54	4.00	3.85	5.61	2.83	6.63	3.21	2.78	4.58	1.54	3.29	45.54
1871	5.56	2.43	2.70	3.38	9.07	3.16	4.12	3.70	1.27	2.68	4.70	1.59	36.43
1872	1.21	1.56	2.00	2.03	2.84	4.59	6.44	2.88	1.67	4.20	1.42	1.52	37.02
1873	4.64	2.52	4.75	4.81	2.68	5.29	4.72	2.88	1.78	4.74	2.98	4.23	50.07
1874	4.29	3.88	3.50	5.11	1.87	2.47	5.33	2.92	2.85	1.35	3.82	4.23	42.63
1875	3.50	2.03	6.89	2.41	1.81	3.57	4.73	4.63	2.90	2.19	3.00	3.68	41.34
1876	4.70	.....	4.68	2.92	.....	.....	.....	2.26	.....	.....	2.55	.....	.....
1877	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.53	1.45	2.50	.....
1878	4.26	6.85	2.60	4.38	4.27	6.17	6.05	1.66	2.24	2.89	2.55	3.75	47.67
1879	3.29	4.09	5.10	3.00	2.86	9.85	5.29	4.07	2.14	3.76	1.82	3.65	49.52
1880	3.82	2.23	1.34	3.63	4.06	2.96	6.14	8.03	1.14	2.92	3.73	2.72	42.72
1881	4.27	1.90	3.62	3.44	3.87	4.93	5.47	2.92	4.50	0.97	6.03	2.94	44.86
1882	2.57	7.62	2.49	3.26	3.38	7.02	3.55	3.65	3.50	0.61	2.28	3.12	43.25
Mean.	3.66	3.54	3.98	3.51	3.72	4.51	5.07	4.04	3.22	2.78	2.99	3.68	44.78

Table showing monthly and annual mean temperatures and precipitation at Collinsville, Ill., from observations made by Dr. J. L. R. Wadsworth.

[Temperature in degrees Fahrenheit.]

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1880	42.3	38.5	41.6	56.1	68.8	72.8	75.5	75.3	65.6	53.5	30.5	24.6	53.7
1881	17.6	28.0	39.9	50.8	69.4	74.7	80.7	77.2	74.7	60.5	41.1	39.7	54.5
1882	30.6	44.5	46.9	58.1	60.0	74.7	73.4	74.5	67.3	60.3	44.3	39.9	55.4
1883	22.3	30.2	38.4	55.0	61.4	71.0	73.8	71.1	69.9	54.9	40.4	36.7	52.3
1884	21.7	32.9	44.2	51.8	62.5	72.3	74.1	72.3	72.2	60.3	43.7	29.1	53.1
1885	21.6	22.8	38.3	54.8	62.6	72.6	74.2	70.4	66.4	55.0	44.1	38.9	51.8
1886	20.7	31.4	42.3	55.6	64.6	70.9	77.0	76.8	69.1	58.0	45.5	24.6	53.2
1887	23.9	36.6	44.0	55.9	67.7	70.7	80.2	76.0	77.5	51.8	37.3	29.8	54.2
Mean.	25.1	33.1	42.0	54.8	64.6	72.5	76.1	74.2	70.3	56.8	40.9	31.8	53.5

[Precipitation in inches and hundredths.]

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1883	1.06	5.36	2.30	2.76	1.92	6.48	2.03	0.82	0.04	5.69	4.22	1.02	33.70
1884	0.82	4.46	2.88	3.44	4.21	3.73	2.21	1.82	3.66	1.64	2.16	5.68	30.71
1885	0.04	0.76	0.45	4.32	2.56	7.42	2.37	2.93	6.79	5.52	2.54	1.55	40.24
1886	3.49	1.59	2.77	1.71	3.72	7.55	0.04	0.35	5.12	0.78	2.74	1.88	33.84
1887	0.60	4.60	3.60	3.99	5.26	2.37	1.77	0.84	2.33	0.75	5.01	3.46	34.78
Mean.	1.80	3.35	2.04	3.24	3.53	5.31	1.68	1.97	3.59	2.88	3.33	2.72	35.85